IN THE UNITED STATES

PATENT AND TRADEMARK OFFICE

Appl. No: 10/071,405

Applicant(s): Frans Andreas Gerritsen, et al.

Filed: February 8, 2002

TC/A.U.: 2600/2624

Examiner: Patrick L. Edwards

Atty. Docket: NL 010106

Title: PROCESSING OF IMAGES IN
A DIRECTION OF SUCCESSION

APPEAL BRIEF

Honorable Assistant Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In connection with the Notice of Appeal dated March 24, 2007, Applicants provide the following Appeal Brief in the above captioned application.

TABLE OF CASES

1. Real Party in Interest

The real party in interest as assignee of the entire right and title to the invention described in the present application is Koninklijke Philips N.V. having a principle place of business at Groenewoudseweg 2, Eindhoven, The Netherlands.

2. Related Appeals and Interferences

There are no known related appeals or interferences at this time.

3. Status of the Claims

Claims 1-9 are pending in the present application. All have been finally rejected. The rejected claims 1-9 are duplicated in the Appendix.

4. Status of Amendments

A final Office Action on the merits was mailed on December 29, 2006. A Reply to the Final Office Action was filed in response thereto traversing the rejections of the final Office Action. A Notice of Appeal was filed on March 30, 2007.

5. Summary of the Claimed Subject Matter[1]

In accordance with an embodiment, method of processing images, in which individual images (1) succeed one another in a direction of succession (6) is disclosed. A multi-dimensional data (2) set is constructed from the individual images (1). The multi-dimensional data (2) set assigns data values to positions in a multi-dimensional space. The multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images. A slice (5) is through the multi-dimensional data set is reconstructed along a cut plane (3) through the multi-dimensional space. Moreover, a direction of the cut plane (3) has a component in the direction of succession (6), and in which a region of interest is located on the basis of the cut plane (3).

---

1 In the description to follow, citations to various reference numerals, drawings and corresponding text in the specification are provided solely to comply with Patent Office Rules. It is emphasized that these reference numerals, drawings and text are representative in nature, and in not any way limiting of the true scope of the claims. It would therefore be improper to import any meaning into any of the claims simply on the basis of illustrative language that is provided here only under obligation to satisfy Patent Office rules for

(Kindly refer to claim 1, Figs. 1-3 and page 4, line 30-page 5, line 23 of the filed application.)

In another embodiment, an image processing system that is arranged to process individual images (1) that succeed one another in a direction of succession (6), and to reconstruct a multi-dimensional data set (2) from the individual images (1) is disclosed. The multi-dimensional data set (2) assigns data values to positions in a multi-dimensional space. The multi-dimensional space (2) is set up by the direction of succession (6) and two directions parallel to the surface of the individual images, to reconstruct a slice (5) through the multi-dimensional data set along a cut plane (3) through the multi-dimensional space. The direction of the cut plane (3) has a component in the direction of succession (6). The system is also arranged to locate a region of interest on the basis of the cut plane (3).

(Kindly refer to claim 7, Figs. 1-3 and page 4, line 30-page 5, line 23 of the filed application.)

In yet another embodiment, a computer program with instructions for processing individual images (1) that succeed one another in a direction of succession (6), and for reconstructing a multi-dimensional data set (2) from the individual images (1)is disclosed. The multi-dimensional data set (2) assigns data values to positions in a multidimensional space, which is set up by the direction of succession (6) and two directions parallel to the surface of the individual images (1). The computer program also includes instructions for reconstructing a slice (5) through the multi-dimensional data set along a cut plane (3) through the multi-dimensional space, where the direction of the cut plane has a component in the direction of succession (6); and for locating a region of interest on the basis of the cut plane (3).

(Kindly refer to claim 8, Figs. 1-3 and page 4, line 30-page 5, line 23 of the filed application.)

maintaining an Appeal.

6. Grounds of Rejection to be Reviewed on Appeal

The issues in the present matter are whether:

I. The Objections to the Specification are proper;

II. Claims 1-4 and 7-9 are properly rejected under 35 U.S.C. § 102(b) in view of *Shiffman, et al.* (U.S. Patent 6,424,732); and

III. Claims 5 and 6 are properly rejected under 35 U.S.C. § 102(b) in view of *Shiffman, et al.* and *Han, et al.* (US Patent 5,457,754).

7. Argument

In this portion of the Appeal Brief, arguments are provided. Notably, wherever applicable Applicants maintain previous arguments for patentability provided in response to Office Actions.

I. The Objections to the Specification

The Examiner has objected to the Specification for failing to include section headings. Applicants respectfully submit that these headings are optional and not mandatory. Applicants have declined to include such headings and have respectfully requested that these objections be withdrawn. As a basis of their traversal, Applicants note that section headings are not statutorily required for filing a non-provisional patent application under 35 USC § 111(a), but per 37 CFR § 1.51(d) are only guidelines that are suggested for applicant's use. (See "Miscellaneous Changes in Patent Practice, Response to comments 17 and 18" (Official Gazette, August 13, 1996) [Docket No: 950620162-6014-02] RIN 0651-AA75 ("Section 1.77 is permissive rather than mandatory. ... [T]he Office will not require any application to comply with the format set forth in 1.77")). (See also MPEP § 608.01(a)).

Accordingly, Applicants respectfully submit that the objections to the Specification are improperly maintained in the Final Office Action and should be withdrawn.

II. Rejection of Claims 1-4 and 7-9 under 35 U.S.C. § 102(b) in view of *Shiffman, et al.*

At the outset Applicants rely at least on the following standards with regard to proper rejections under 35 U.S.C. § 102. Notably, a proper rejection of a claim under 35 U.S.C. § 102 requires that a single prior art reference disclose each element of the claim. *See, e.g., W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983). Anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. *See, e.g., In re Paulsen,* 30 F.3d 1475, 31 USPQ2d 1671 (Fed. Cir. 1994); *In re Spada*, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Cir. 1990). Alternatively, anticipation requires that each and every element of the claimed invention be embodied in a single prior art device or practice. *See, e.g., Minnesota Min. & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 24 USPQ2d 1321 (Fed. Cir. 1992). For anticipation, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. *See, e.g., Scripps Clinic & Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 18 USPQ2d 1001 (Fed. Cir. 1991).

a. *Shiffman, et al.* does not disclose a slice through a multidimensional space that is reconstructed along a cut plane

Claim 1 is drawn to a method of processing images and features:

"...***a multi-dimensional data set is constructed*** *from the individual images,*

which multi-dimensional data set assigns data values to positions in a multi-dimensional space,

which multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images,

a slice through the multi-dimensional data set is reconstructed along a cut plane through the multi-dimensional space..."

Claims 7 and 8, drawn to an imaging processing system and a computer program include similar features.

Through a review of the filed application and the supporting drawings, as referenced in Section 5 above, in representative embodiments, the noted features of claims 1, 7 and 8 provide for the reconstruction of a slice 5 along a cut plane 3. As discussed in the Response under Rule 116, the rejected claims feature a multidimensional data set 2 that is **constructed from individual images 1**; and **a slice 3** through the multi-dimensional data set that is **reconstructed along a cut-plane**. Plainly, a **multidimensional set of data is constructed** and the **slice is reconstructed therefrom.**

In connection with the description of Figs. 1 and 2, the filed application discloses:

"Fig. 1 is notably a representation of the multi-dimensional data set (in this case a 3D data set) 2 that is composed of the individual images 1 that are arranged one behind the other in the direction of succession 6. This means that the images that relate to a later instant in time are shown further forwards in Fig. 1. The cut plane 3 extends approximately perpendicularly to the plane of drawing in Fig. 1. The reconstructed slice along the cut plane 3 is shown in a simple form in Fig. 2. For the sake of simplicity, the region of interest 7, 8, 9 is indicated in a few (three) individual images only."

Thus, there is a **construction** and a **reconstruction** as specifically recited in claims 1, 7 and 8, with the **construction being of a data set** and the **reconstruction being of a slice along a plane.**

The Office Action directs Applicants' attention to column 8, lines 4-5 of *Shiffman, et al.* for the teaching of the construction and to column 8, lines 15-17 for the reconstruction as claimed. Moreover, Fig. 9 is relied upon in the germane portions of the Office Action. To wit, the Office Action asserts:

> Constructing a multi-dimensional data set is constructed from the individual images (col. 8 lines 4-5) [The multi-dimensional data set is the 3-dimensional volume (Fig. 8, 42) that results from stacking the 2-dimensional images (21, 26, 32).],

and

> reconstructing a slice through the multi-dimensional data set along a cut plane through the multi-dimensional space (col. 8 lines 15-17) [The reconstructed slices are represented by the 2-dimensional

planes {note these are referred to as 2-dimensional planes and not 2-dimensional images (21, 26, 32)} as shown in Figure 9.} such that, the direction of the cut plane has a component in the direction of succession (col. 8 line 17) [The cut plane is the direction in which the image volume (42) is sliced. Shiffman discloses

Applicants note that the disclosure at column 8, lines 15-17 of *Shiffman, et al.* states:

> Now referring to FIG. 9, once the image volume is generated and the image volume can be sliced into parallel 2-dimensional planes in any direction. FIG. 9 shows the cross sectional object images of a forked structure for parallel 2-dimensional planes of the image volume in 3 orthogonal directions. For segmenting complex object images from an image volume it is preferential to divide the image volume into parallel 2-dimensional planes in 3-orthogonal directions and apply the segmentation method described below to the three sets of planes.

Clearly, *Shiffman, et al.* discloses slicing a three-dimensional image into parallel two-dimensional planes. This passage does not teach or suggest the reconstruction of a two dimensional image from a data set, but rather the deconstruction of an image to form a set of images. Plainly, *Shiffman, et al.* teaches decomposing a volume into constituent two dimensional images. By contrast, the claims under present consideration feature reconstructing a **two-dimension** slice from a data set and along a defined plane.

In furtherance of their position, Applicants direct the Examiner to column 8, lines 1-14 of *Shiffman, et al.*, which states:

> Now referring to FIG. 8, once the 2-dimensional images are obtained, and segmented, the images are stored in a computer that is capable of constructing a 3-dimensional image volume 42. The image volume 42 is constructed from the 2-dimensional images 21, 26 and 32 that have been undergone segregation described above, however, the method of grouping or labeling cross sectional object images in an image volume is general and segregation prior to constructing the image volume 42 from the 2-dimensional images 21, 26 and 32 is not required. Visual inspection again shows that the cross sections 13, 14 and 11 likely belong to the same object image, but the connectivity or is grouping of other cross sectional object images in the image volume 42 is not readily made by inspection.

Applicants submit that this portion of *Shiffman, et al.* sets forth clearly the difference between the applied art and the claims under present consideration: *Shiffman, et al.* discloses obtaining, segmenting and storing of two-dimensional images, which are used to construct an image volume 42; and the claims under present consideration are

drawn to constructing a data set and reconstructing a slice through a cut plane. Again, as distinguished from the rejected claims, which reconstruct ***a slice through the multi-dimensional data set along a cut plane***, the teachings of Shiffman, *et al.* relate to the **construction, from two dimensional images, three dimensional images**.

Applicants' position is further buttressed by the disclosure in the Summary of *Shiffman, et al.* that:

> The objects of the invention are obtained providing a method for segmenting complex object images, such as arterial structures, from an image volume. **The image volume is preferably obtained by acquiring 2-dimensional images that represent imaged slices of an image volume.** The method is most useful in the field of medical imaging where the 2-dimensional images are digitized images obtained from CT, MR or ultrasound acquisition data and are comprised of Voxels. While it is not required, in the preferred embodiment of this invention the 2-dimensional images are segmented to define the salient regions of the images containing the object images to be segmented prior to constructing a 3-dimensional image volume. (Emphasis provided).

Accordingly, Applicants respectfully submit that the applied art fails to disclose at least one feature of claims 1, 7 and 8; and that one of ordinary skill in the art would recognize that rather than reconstructing a slice from a data set, the applied art deconstructs, or decomposes a two-dimensional image from a three-dimensional image. Clearly, the present claims build up and the applied art tears apart. Therefore, one of ordinary skill in the art would recognize at least one difference between the rejected and the reference disclosure.

For at least the reasons set forth above, Applicants respectfully submit that a prima facie case of anticipation has not been established. Therefore, claims 1, 7 and 8 are patentable over the applied art. Moreover, claims 2-6 and 9, which depend from claims 1 and 8, respectively, are also patentable for at least the same reasons.

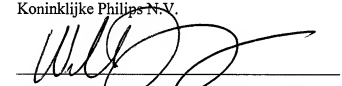
II. Rejection of claims 5 and 6 are properly rejected under 35 U.S.C. § 102(b) in view of *Shiffman, et al.* and *Han, et al.* (US Patent 5,457,754).

Claims 5 and 6 are rejected under 35 U.S.C. § 103(a) in view of *Shiffman* in view of *Han, et al.* While Applicants in no way concede the propriety of this rejection, Applicants submit that claims 5 and 6 are patentable at least because the claim from which they ultimately depend is patentable. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596

8. Conclusion

In view of the foregoing, applicant(s) respectfully request(s): the withdrawal of all objections and rejections of record; the allowance of all the pending claims; and the holding of the application in condition for allowance.

Respectfully submitted on behalf of:
Koninklijke Philips N.V.



by: William S. Francos, Esq. (Reg. No. 38,456)

June 19, 2007
Volentine Francos & Whitt, PLLC
One Freedom Square
11951 Freedom Dr.
Reston, VA 20190
(717)375.3513 (v)

Appendix

Claims on Appeal

Claims on Appeal:

1. A method of processing images, in which
individual images succeed one another in a direction of succession,
a multi-dimensional data set is constructed from the individual images,
which multi-dimensional data set assigns data values to positions in a multi-dimensional space,
which multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images,
a slice through the multi-dimensional data set is reconstructed along a cut plane through the multi-dimensional space, and
the direction of the cut plane has a component in the direction of succession, and in which a region of interest is located on the basis of the cut plane.

2. A method of processing images as claimed in claim 1, in which
segmentation of a region of interest from the one or more relevant images is performed in one or more of the individual images, and
such segmentation is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set.

3. A method of processing images as claimed in claim 2, in which
an edge is located in the reconstructed slice, and
the segmentation of the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant image.

4. A method of processing images as claimed in claim 3, in which
respective slices through the multi-dimensional data set are reconstructed along a plurality of cut planes through the multi-dimensional space, and
the directions of the individual cut planes have components in the direction of succession,
individual edges are tracked in the individual slices,

and the segmentation of the region of interest in the one or more images is performed on the basis of the individual locations of the respective edges found in the relevant image.

5. A method of processing images as claimed in claim 4, in which
a boundary of the region of interest is derived by interpolation between the individual locations in the relevant image of the respective edges found.

6. A method of processing images as claimed in claim 5, in which the interpolation is performed inter alia on the basis of a priori information concerning the region of interest.

7. An image processing system that is arranged to process individual images that succeed one another in a direction of succession, and
to reconstruct a multi-dimensional data set from the individual images,
which multi-dimensional data set assigns data values to positions in a multi-dimensional space,
which multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images,
to reconstruct a slice through the multi-dimensional data set along a cut plane through the multi-dimensional space, where
the direction of the cut plane has a component in the direction of succession, and to locate a region of interest on the basis of the cut plane.

8. A computer program with instructions for processing individual images that succeed one another in a direction of succession, and for
reconstructing a multi-dimensional data set from the individual images,
which multi-dimensional data set assigns data values to positions in a multidimensional space,
which multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images,

reconstructing a slice through the multi-dimensional data set along a cut plane through the multi-dimensional space, where
the direction of the cut plane has a component in the direction of succession, and for locating a region of interest on the basis of the cut plane.

9. A medical diagnostic workstation that is provided with an image processing system as claimed in claim 7, for example, programmed by way of a computer program as claimed in claim 8.

Appendix

Evidence (None)

Appendix

Related Proceedings (None)